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EXAMINER	
LEUNG, JENNIFER A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/553,990	XU ET AL.	
	Examiner	Art Unit	
	JENNIFER A. LEUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6-11,14-27,30-35,38-40,49-54 and 56-65* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-11,14-27,30-35,38-40,49-54 and 56-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 10, 2008 has been entered.

Status of the Claims

2. Claims 4, 5, 12, 13, 28, 29, 36, 37, 41-48 and 55 are cancelled. Claims 59-65 are newly added. Claims 1-3, 6-11, 14-27, 30-35, 38-40, 49-54 and 56-65 are under consideration.

Claim Objections

3. Claims 1 and 15 are objected to because of the following informalities:

In claim 1, the relationship between "a first reaction zone" in lines 6-7 and "a first reaction zone" in line 8 should be established. In claim 15, the last two lines (presented at the top of page 5) should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1, 3, 7, 9, 11, 15, 17, 19-21, 23, 25, 27, 31, 33, 35, 39, 49-51, 54, 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925) and Corella et al. (Ind. Eng. Chem. Process Des. Dev. 1983, 22, 329-334).

Regarding claims 1, 9, 17, 20 and 21, Kmecak et al. (see FIG. 8; generally, page 38, line 13 to page 41, line 20) discloses a riser reactor comprising:

a) a prelift zone (i.e., the restricted diameter portion of the riser **1**, located between the lift gas inlet conduit **4** and the charge oil inlet conduit **5**) having a prelift zone diameter and a prelift zone height and containing catalyst cracking catalyst (i.e., introduced in regenerated form via conduit **3**; page 43, lines 7-26; also, page 14, line 3 to page 17, line 23), the prelift zone being adapted to lift the catalyst to a first reaction zone without cracking (i.e., the lift gas to conduit **4** for contacting the regenerated catalyst is a dry hydrogen containing gas, optionally supplemented with steam and/or water, and most preferably containing about 0-6% C3-plus hydrocarbons. Such contact is conducted prior to contacting the regenerated catalyst with the oil feed fed via conduit **5** to be cracked. See page 28, lines 9-25; page 44, line 12 to page 46, line 2);

b) the first reaction zone (i.e., the restricted diameter portion of the riser **1**, located between the charge oil inlet conduit **5** and the frusto-conical transition section to portion **2**, not labeled) having a constant first reaction zone diameter and a first reaction zone height, the first reaction zone containing catalytic cracking catalyst lifted from the prelift zone and reacting a

hydrocarbon (i.e., received from the charge oil inlet **5**) in the first reaction zone; and

c) a second reaction zone (i.e., the expanded or larger diameter portion of the riser **2**) having a second reaction zone diameter that is larger than the first reaction zone diameter and containing catalytic cracking catalyst and reacted hydrocarbons from the first reaction zone.

The prelift zone (i.e., riser **1**, between inlets **4** and **5**) and first reaction zone (i.e., riser **1**, between inlet **5** and the transition) are defined by the same riser reactor portion **1**, and therefore, the ratio of the first reaction zone diameter to the prelift zone diameter is approximately 1:1.

Additionally, Kmecak discloses that the diameter of the second reaction zone **2** is expanded or larger than the diameter of the first reaction zone **1** (see FIG. 8; also, see page 27, lines 4-15; page 40, lines 3-8). From the illustration in FIG. 8, it appears that the ratio of the second reaction zone **2** diameter to the first reaction zone **1** diameter is roughly 2.5:1. Kmecak, however, does not state that FIG. 8 is to scale, and does not indicate a specific diameter ratio for the second reaction zone **2** diameter to the first reaction zone **1** diameter.

Also, from the illustration in FIG. 8, it appears that the height of the first reaction zone **1**, between inlet **5** and the transition, is roughly 30% the height of the riser reactor, and the height of second reaction zone **2** is roughly 50% of the height of the riser reactor. Kmecak et al., however, does not state that FIG. 8 is to scale, and does not indicate a specific height of the first reaction zone or a specific height of the second reaction zone **2**, relative to the height of the riser.

In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select suitable heights and diameter ratios for each of the prelift zone, the first reaction zone and the second reaction zone in the riser reactor of Kmecak et al., such as the instantly claimed heights and diameter ratios, if not already inherent therein, because changes in

size merely involves routine skill in the art, *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955), and the specific dimensions for each of the respective zones of the riser reactor would have been considered typical design considerations by one having ordinary skill in the art, as evidenced by Williams et al. and Corella et al.

In particular, Williams et al. (column 4, lines 21-29, with emphasis added) teaches,

> "In each of the reactor sections **9**, **10**, **11** and **12**, reaction conditions suitable for substantially optimum conversion of the various hydrocarbon feedstreams introduced into the successive sections of the riser reactor to the desired products may be obtained by variations in vapor velocity, catalyst loading, feed preheats, and regenerator temperature. *The length and diameter of the various sections of reactor **2** are proportioned to maintain a desired reaction time in each section*."

In addition, Corella et al. teaches a riser reactor (see FIG. 1 on page 330) having an enlarged upper zone $H_{5\text{-}6}$ relative to its lower zone $H_{1\text{-}4}$, with a conjunct (tronconical) section $H_{4\text{-}5}$ disposed therebetween. Corella et al. (at page 332, column 1, last paragraph) teaches that,

> "Efficiency values of the contactor have been correlated with the contactor geometry and with the gas velocity at the inlet. The increase of gas conversion obtained in our reactor, compared with a conventional cylindrical fluidized bed, is due to the fact that the catalyst placed in the tronconical and in the upper zones is under different conditions than those which would exit if the bed were a cylindrical one. In both zones indicated above and due to the increase in cross section, the gas velocity is smaller than it is in a cylindrical bed, with the result of a better solid-gas contact and a consequent increase in gas conversion."

Table I of Corella et al. (see page 332) compares the improved gas conversion values $X_{o.r.}$ of a number of enlarged diameter risers with the gas conversion values $X_{f.b.}$ of a conventional cylindrical riser. The enlarged diameter risers are designated R-12/2/3, R-6/2/4, R-6/4/6.25, R-6/2/2 and R-10/2/3, wherein the first number indicates the length of the lower zone $H_{1\text{-}4}$, the

middle number indicates the length of the conjunct (tronconical) section $H_{4\text{-}5}$, and the third number indicates the diameter ratio (S/s) of the enlarged upper zone relative to the lower zone.

Thus, the specific heights and diameter ratios are not considered to confer patentability to the claims since the precise heights and diameter ratios would have been considered result effective variables by one having ordinary skill in the art, as evidenced by Williams et al. and Corella et al. In the instant case, one having ordinary skill in the art would have routinely optimized the heights and diameter ratios of the various zones in the riser reactor of Kmecak et al. to achieve the desired reaction conditions, relationship of residence times, gas conversion, etc., across the zones of the riser reactor for a producing a desired product from the hydrocarbon feed, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Please note that the recitations with respect to reaction temperatures, catalyst to oil ratios, and reaction times (see, e.g., claim 9) are considered process limitations which do not impart further patentable weight to the apparatus claims. See MPEP 2114.

Regarding claims 3, 11 and 19, from the illustration in FIG. 8, it appears that the prelift zone **1** height, between inlet conduits **4** and **5**, is roughly 10% of the height of the riser reactor. Kmecak, however, does not state that the figure is to scale. Kmecak et al. also does not state a specific diameter for the prelift zone. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate height and diameter for the prelift zone in the modified riser reactor of Kmecak et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, in order to

produce the desired process conditions within the prelift zone for achieving an optimum conversion of they hydrocarbon to the desired products in the riser, as evidenced by Williams et al (see comments above).

Regarding claims 7, 15 and 23, Kmecak et al. discloses a first junction section (i.e., the transition zone, not labeled; FIG. 8) between the first reaction zone (i.e., the riser **1** portion, above inlet **5**) and the second reaction zone (i.e., riser **2** portion), wherein the first junction section forms a circular truncated cone shape. From the illustration, it appears that the first junction section has a "vertical section vertex angle" in the range of about 30° to 80°, but Kmecak et al. does not state that FIG. 8 is to scale. Corella et al., however, teaches that when the difference in diameters between the upper zone and the lower zone is large, dead zones could appear. To avoid dead zones in large size contactors, Corella et al. suggests that the angle of the tronconical zone should be at least 70° (see page 333, column 2, second to last paragraph). Accordingly, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable vertical section vertex angle for the first junction section in the apparatus of Kmecak et al., such as an angle within the instantly claimed range of about 30° to 80°, if not already inherent therein, because such angle an angle would help avoid any dead zones in the riser, as taught by Corella et al.

Regarding claims 25, 27, 31, 33, 35 and 39, Kmecak et al. discloses a process of conducting a fluidized catalytic conversion process comprising the claimed process steps a), b) and c). (see, generally, page 38, line 13 to page 41, line 20). The limitations with respect to the dimensions, angles, etc. of the various zones of the riser reactor do not impart further patentability to the process claims. Apparatus limitations, unless they affect the process in a

manipulative sense, have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 (CCPA 1947).

Regarding claims 49-51, 56 and 57, Kmecak et al. further discloses a conduit (i.e., inlet **7** or **8**; FIG. 8) adapted to supply a quenching medium or a reactable feedstock (i.e., residual oil feed via inlet 7; steam and/or water introduced as diluent via inlet **8**; page 40, line 1 to page 41, line 6) between the first reaction zone (i.e., the riser **1** portion, between inlet **5** and the transition) and the second reaction zone (i.e., the riser **2** portion). The quenching medium inlet is capable of functioning as a heat exchanger in the second reaction zone **2**, for cooling at least a portion of hydrocarbon and catalyst passing from the first zone to the second zone.

Regarding claim 54, Kmecak et al. discloses a conjunct section (i.e., the frusto-conical transition zone, not labeled; FIG. 8) between the first reaction zone (i.e., the riser **1** portion, above inlet **5**) and the second reaction zone (i.e., riser **2** portion).

5. Claims 2, 6, 8, 10, 14, 16, 18, 22, 24, 26, 30, 32, 34, 38, 40 and 59-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams et al. (US 4,422,925) and Corella et al. (Ind. Eng. Chem. Process Des. Dev. 1983, 22, 329-334), as applied above, and further in view of Myers et al. (US 4,070,159).

Regarding claims 59-61, 6, 8, 14, 16, 22 and 24, Kmecak et al. (see FIG. 8) does not disclose an outlet zone positioned atop the second reaction zone, with a junction section therebetween, wherein the outlet zone has an outlet zone diameter that is reduced with respect to the second reaction zone diameter. Myers et al., however, teaches a riser reactor (i.e., riser tube

10; FIG. 3) comprising an outlet zone atop the reaction zone, wherein the outlet zone has an outlet zone diameter that is reduced with respect to the reaction zone diameter, said outlet zone being separated from the reaction zone by a junction section (i.e., the step-down section at **32**, see column 4, lines 20-31). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the claimed outlet zone and junction section in the modified apparatus and process of Kmecak et al., because the outlet zone and junction section would have enhanced the separation of catalyst particles from the gas stream, as taught by Myers et al. Furthermore, it would have been within the level of ordinary skill in the art to select suitable dimensions for the outlet zone and a suitable angle for the junction section, etc. in the modified apparatus of Kmecak et al., to predictably control the transport velocity, and hence, the efficiency of separation between the catalyst particles and the gas stream.

Regarding claims 2, 10 and 18, Kmecak et al. discloses the riser reactor may comprise a vertical length of about 49 meters, or about 160 feet (page 49, lines 7-23). Kmecak et al. also discloses, "The riser reactor may be substantially any desired vertical length which will be compatible with the adjacent catalyst regeneration apparatus," (page 41, lines 15-20). Accordingly, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable height for the total riser reactor of the modified apparatus of Kmecak et al., such as the instantly claimed height of about 10 meters to about 60 meters, as would be appropriate for the intended use.

Regarding claims 62, 63, 26, 30, 32, 34, 38 and 40, as modified by Myers et al., the process of Kmecak et al. would further comprise the step of passing the second reaction zone stream from the second reaction zone to the outlet zone. The limitations with respect to the

dimensions, angles, etc. of the various zones of the riser reactor do not impart further patentability to the process claims. Apparatus limitations, unless they affect the process in a manipulative sense, have little weight in process claims.

Regarding claim 64, the same comments with respect to Kmecak et al., Williams et al., Corella et al. and Myers et al. apply. The recitation with respect to reactor residence time under section d), however, is considered a process limitation that does not impart further patentable weight to the apparatus claims.

Regarding claim 65, the same the same comments with respect to Kmecak et al., Williams et al., Corella et al. and Myers et al. apply.

6. Claims 52, 53 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925) and Corella et al. (Ind. Eng. Chem. Process Des. Dev. 1983, 22, 329-334), as applied above to claims 1 and 49 above, and further in view of Carr et al. (US 3,639,228).

Kmecak et al. is silent as to the quench medium comprising catalyst (e.g., regenerated catalyst with a residual carbon content of less than about 0.1 wt%, semi-regenerated catalyst having a residual carbon content of at least 0.1 wt% to about 0.9 wt%, or fresh catalyst). Carr (FIG. 1) teaches the introduction of catalyst at various locations (i.e., at pipes **18**,**20**) downstream from the inlet of the reactor (i.e., adjacent catalyst inlet **16**). The catalyst may comprise regenerated or semi-regenerated catalyst (i.e., regenerated catalyst with a level of carbon on the regenerated catalyst from about 0.05 to 0.3 wt%; column 5, lines 34-59), as well as fresh catalyst (i.e., via make-up catalyst line **66**). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a source of quenching medium comprising

catalyst to the riser reactor in the modified apparatus of Kmecak et al., because the downstream injection of additional catalyst increases the yield and selectivity of the cracking reaction within the riser reactor by shifting a major portion of the cracking reaction away from the inlet end of the reactor and thereby distributing the cracking reaction over the length of the riser rather than concentrating the reaction at the inlet of the riser, as taught by Carr et al. (column 1, lines 33-73).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 25-27, 30-35, 38-40, 62 and 63 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-27 of U.S. Patent No. 6,495,028 (hereafter US '028).

Although the conflicting claims are not identical, they are not patentably distinct from each other because both the instant application and US '028 claim the same fluidized catalytic conversion process (see, e.g., US '028: claims 1-3, 9).

Please note that apparatus limitations, unless they affect the process in a manipulative sense, have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 (CCPA 1947). In any event, US '028 further claims that the fluidized catalytic conversion process may be conducted in a riser reactor of the instantly claimed configuration (i.e., the "multi-cascade riser reactor"; see, e.g., claims 4 and 9-13).

Response to Arguments and Declarations

8. Applicant's arguments filed November 10, 2008 have been fully considered but they are not persuasive.

Comments regarding the rejection of the claims under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. in view of Williams et al. (and tertiary references).

Applicant (at page 16, last paragraph, to page 17, first paragraph) argues.

> "There is no disclosure in Kmecak et al. with respect to employing the riser reactor for olefin reduction. Further, the riser reactor disclosed in Kmecak et al. would not achieve effective reduction of olefin and simultaneous production of desirable products in any event. In the first instance, the riser reactor of Kmecak et al. is designed to have an expanded (e.g., larger diameter) portion which provides a high temperature and a short contact time (i.e., residence time). See page 40, lines 15-21. Kmecak et al. teaches that the contact time should be no more than 3 seconds (see page 41, lines 7-10), and the short contact time can reduce the tendency of over-cracking to occur…"

The Examiner respectfully disagrees.

Claim 1, e.g., is an apparatus claim. A recitation of the intended use of the claimed apparatus must result in a structural difference between the claimed invention and the prior art in

order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In the instant case, the modified apparatus of Kmecak et al. comprises a prelift zone, a first reaction zone, and a second reaction zone, wherein the second reaction zone is enlarged relative to the first reaction zone. This riser structure is the same as or obvious over the instantly claimed riser structure. Please note that temperature and residence/contact time are considered process/functional limitations that do not impart further patentability to the apparatus claims. See also MPEP 2114.

Also, the modified apparatus of Kmecak et al. would be structurally capable of performing the argued intended use of "olefin reduction", by adjusting the parameters of temperature and residence time within each reaction zone so that they were favorable to olefin reduction (and iso-paraffin production). For example, the temperature of a particular reaction zone could be lowered by injecting a quenching medium into the zone. The residence/contact time in a particular reaction zone can be increased or decreased by varying the feed rate of feedstock and catalyst into said zone. Also, as discussed in Corella et al., the residence time in the enlarged diameter zone may be increased by a certain degree due to the decreasing velocity of the catalyst and hydrocarbon stream through the zone (page 332, column 1, last paragraph).

Claim 25, e.g., is process claim generic to a hydrocarbon cracking reaction. Apparatus limitations (e.g., the specific dimensions of the riser, etc.), unless they affect the process in a manipulative sense, have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 (CCPA 1947). In the instant case, the

hydrocarbon cracking reaction of Kmecak et al. is the same as or obvious over the claimed process. It is further noted that none of Applicant's process claims recite any of the process steps or conditions, e.g., residence times, temperatures, C/O ratios, etc., for producing a gasoline product of reduced olefin content and increased iso-paraffin content. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant (at page 17, last paragraph, to page 19, first paragraph) further argues that Williams et al. teaches away from the claimed invention. However, this argument is not found persuasive. Please note that Williams et al. was merely relied upon for its general teaching that it would have been obvious to proportion the length and diameter of the various sections of a riser reactor to maintain a desired reaction time in each section, for providing substantially optimum conversion of hydrocarbons to the desired products within each section (see column 4, lines 21-30). The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Comments regarding the prior art to Gartside (US 5,167,795).

Applicant argues that the cited patent to Gartside is "irrelevant and unpredictable to assessing the results or degree of improvement achieved by the claimed riser reactor."

The Examiner respectfully disagrees and contends that Applicant has made this conclusion based on improper comparisons of the experimental data presented by Gartside.

In TABLE I, column A presents the results of a thermal cracking experiment, i.e., no catalyst; column B presents the results of a catalytic cracking experiment using a conventional catalyst in a riser reactor; column C presents the results of a catalytic cracking experiment using a "high activity catalyst" in an FCC reactor under low residence time or a QC reactor under high residence time; and column D presents the results of a catalytic cracking experiment using a "high activity catalyst" that is the same as the catalyst under column C, except in a QC reactor under low residence time.

Applicant (e.g., at page 20, last paragraph, to page 21, third paragraph, of the arguments) makes various comparisons of the data in columns A-D, including a comparison of column A to column B, a comparison of column B to column C, and a comparison of column B to column D.

However, the only proper comparison for establishing the effect of residence time and temperature on olefin and paraffin yields is a comparison of the data in columns C and D, because only these two experiments vary residence time and temperature, while keeping all other reaction parameters (i.e., high activity catalyst, light FCC naptha feed and QC reactor) constant. In fact, Gartside specifically states that the, "Two cases employing the high activity catalyst are shown to illustrate the effect of residence time on olefin yields," (see column 13, line 68 to column 14, line 20).

As clearly seen from columns C and D, when the residence time is increased from 0.15 seconds to 0.9 seconds and the temperature is decreased from 540 °C to 510 °C, there is an increase in the paraffin content and a decrease in the olefin content, as shown by the increase in the paraffin/olefin ratio from 0.46 to 1.14. This is the same effect argued by Applicant.

Thus, Applicant's result of increased iso-paraffin content and reduced olefin content in

the product stream would have been expected by one of ordinary skill in the art.

Comments regarding the declaration under 37 C.F.R. 1.132 by Xu Youhao, filed April 1, 2008.

Applicant (beginning at middle of page 19) argues that the Xu declaration overcomes the rejections under 35 U.S.C. 103(a) by a showing of unexpected results.

Please note that the deficiencies in the Xu declaration were previously addressed in the final Office Action mailed on July 9, 2008. The Examiner directs Applicant to the same comments presented therein.

Comments regarding the declaration under 37 C.F.R. 1.132 by Xieqing Wang, filed November 10, 2008.

Applicant has provided the Wang declaration in an attempt to show non-obviousness by evidence of unexpected results. In particular, Mr. Wang states that the "significant reduction of olefin in the gasoline from a level of 40% - 60% by weight to a level of 10% - 30% by weight" would have been unexpected to those skilled in the art (items 7, 8). Mr. Wang then states that the reduction of olefin occurs because the riser reactor design allows for,

> "a short residence time in the first reaction zone and a longer residence time, i.e., longer than 3 seconds, or even 5 seconds or greater, in the second reaction zone. Given this design, heavy hydrocarbon feedstock is cracked in the first reaction zone at a high temperature and a short residence time into a lighter hydrocarbon feedstock and olefin; then, in the second reaction zone where the diameter is larger than that of the first reaction zone, the olefin produced in the first reaction zone is effectively converted to iso-paraffin at a lower temperature during a long residence time through hydrogen transfer reactions, etc." (item 9).

> "… combining the two concepts of "higher temperature and shorter residence time" and "lower temperature and longer residence time" in one single riser reactor with an

> enlarged section in the middle part of the riser, has achieved a synergism for olefin reduction and iso-paraffin production, with relatively minimum operation difficulty, investment cost and energy consumption." (item 14).

The declaration is insufficient to overcome the rejections under 35 U.S.C. 103(a) over Kmecak et al. in view of Williams et al. because the showing is not commensurate in scope with the claims. Whether the unexpected results are the result of unexpectedly improved results or a property not taught by the prior art, the objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support.

In the instant case, apparatus claim 1, e.g., is drawn to a riser reactor comprising a pre-lift zone, a first reaction zone, and a second reaction zone, wherein the second reaction zone is enlarged relative to the first reaction zone. Such a riser reactor was known or obvious over the prior art, as disclosed by the teachings of Kmecak et al. and Williams et al. Please note that temperature and residence time are considered process/functional limitations, not apparatus limitations. See MPEP 2114.

In addition, process claim 25, e.g., is generic to a hydrocarbon cracking reaction. None of the process claims recite any of the process steps or conditions, e.g., residence times, temperatures, C/O ratios, etc., for producing a gasoline product of reduced olefin content and increased iso-paraffin content, as discussed in the declaration.

The Examiner further asserts that Applicant's invention is not in the riser reactor apparatus, but *a specific process of operating a prior art apparatus*. As addressed above, olefin content decreases and iso-paraffin content increases when a hydrocarbon feedstock is first catalytically cracked under a high temperature and short residence time in a first reaction zone and, subsequently, catalytically cracked under a low temperature and long residence time in a

second reaction zone. These are process limitations.

Also, as evidenced by Applicant's previously obtained and related patent, US 6,495,028, a gasoline of decreased olefin content and enriched isobutane and iso-paraffin content is produced according to specific process steps (see, e.g., claims 1-3). However, the apparatus in which the process is to be conducted is not critical, since the reaction may be carried out using an iso-diameter riser, an iso-linear-velocity riser, a multi-cascade riser, a fluidized bed reactor, or a combination reactor of an iso-diameter riser and a fluidized bed (see, e.g., claims 4-13). The use of a multi-cascade riser (i.e., the enlarged diameter riser reactor of the instant application) is merely a preferred embodiment. Thus, US 6,495,028 further evidences that it is not the apparatus, *but the specific process steps and conditions*, which are critical to the result of reduced olefin content and increased iso-paraffin content in the product stream.

Regarding item 12 of the declaration, Mr. Wang comments that, in his opinion, the riser reactor disclosed in EP 0 171 60 would not achieve effective reduction of olefin and simultaneous production of desirable products.

This showing is not found persuasive. Please note that claim 1, e.g., is an apparatus claim. The argued features of temperature and residence time are process/functional features, not apparatus/structural features. A recitation of the intended use of the claimed apparatus must result in a structural difference between the claimed apparatus and the prior art in order to patentably distinguish the claimed apparatus from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

In the instant case, the modified apparatus of Kmecak would be structurally capable of performing the intended use of producing a product of decreased olefin content and increased

iso-paraffin content, by varying the parameters of temperature and residence time in each zone. For example, the temperature of a particular reaction zone can be lowered by injecting a quenching medium into the zone. Also, the residence time in a particular reaction zone can be increased or decreased by varying the feed rate of feedstock and catalyst into the zone. Also, as discussed in Corella et al., the residence time in the enlarged diameter zone may be increased by a certain degree due to the decreasing velocity of the catalyst and hydrocarbon stream through the zone (see page 332, column 1, last paragraph).

Mr. Wang further comments on the lack of an outlet section on the riser reactor of EP '460 (also under item 12). However, please note that claim 1, e.g., does not recite an outlet section. Also, an outlet section is addressed in the rejection of the dependent claims, in view of a tertiary reference.

Regarding item 13 of the declaration, the Examiner does not understand how the cited publication to Hong-Hong Shan et al. (which is directly toward an entirely different apparatus, comprising two individual iso-diametric risers) is relevant to the issue of proving unexpected results in an apparatus comprising a single enlarged diameter riser.

Regarding item 16 of the declaration, the showing is not persuasive because the comparison has been made to a conventional iso-diameter riser, and not the closest prior art (i.e., an enlarged diameter riser).

Regarding item 17 of the declaration, the deficiencies in the Xu declaration were previously addressed in the final Office Action mailed on July 9, 2008. The Examiner directs Applicant to the same comments presented therein.

Regarding item 18 of the declaration, please refer to the above made comments with

respect to the prior art of Gartside.

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

Comments regarding the declarations under 37 CFR 1.132 by Zhiguo Li and Guozhi Wei, filed November 10, 2008.

Applicant has provided the Li and Wei declarations in an attempt to show non-obviousness by evidence of commercial success. In particular, Mr. Li attributes the commercial success of the apparatus to the technical feature that,

> "… it is able to dramatically decrease the olefin content in gasoline through a creative design of a stepped riser... also known as the MIP apparatus. The MIP apparatus includes two reactor zones wherein the first (lower) reaction zone is designed for high temperature and short residence time to produce olefins from cracking hydrocarbons, and the second (upper) reaction zone is designed for low temperature and long residence time to transform olefins into iso-paraffin. Consequently, these technical features bring advantages to the users of the apparatus, for example, significant olefin reduction, while simultaneously producing iso-paraffin..." (see response, page 25).

Mr. Wei similarly addresses a reduction in olefin content and an increase in paraffin content while employing a "special catalyst" in the MIP apparatus.

The declarations are insufficient to overcome the rejections under 35 U.S.C. 103(a) over Kmecak et al. and Williams et al., because the showings are not commensurate in scope with the claims. Objective evidence of nonobviousness including commercial success must be commensurate in scope with the claims. *In re Tiffin*, 448 F.2d 791, 171 USPQ 294 (CCPA 1971). In order to be commensurate in scope with the claims, the commercial success must be due to claimed features, and not due to unclaimed features. *Joy Technologies Inc. v. Manbeck*, 751 F.

Supp. 225, 229, 17 USPQ2d 1257, 1260 (D.D.C. 1990), aff 'd, 959 F.2d 226, 228, 22 USPQ2d 1153, 1156 (Fed. Cir. 1992).

In the instant case, claim 1, e.g., is drawn to a riser reactor apparatus comprising a pre-lift zone, a first reaction zone, and a second reaction zone, wherein the second reaction zone is enlarged relative to the first reaction zone. Such an apparatus, i.e., a stepped riser, was known or obvious over the prior art, as disclosed in the teachings of Kmecak et al. and Williams et al. Please note that temperature and residence time are considered process/functional limitations, and not apparatus/structural limitations. See MPEP 2114.

In addition, process claim 25, e.g., is generic to a hydrocarbon cracking reaction. The claim does not recite any of the process steps or conditions, e.g., residence times, temperatures, C/O ratios, etc., for producing a gasoline product of reduced olefin content and increased iso-paraffin content.

The Examiner further asserts that Applicant's commercial success is not attributed to the riser reactor apparatus, *but a specific process of using a known apparatus,* since it is the process steps and conditions, and not the apparatus, that is critical to the result of reduced olefin content and increased iso-paraffin content in the gasoline product. (see comments above).

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER A. LEUNG whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A. Leung/
Primary Examiner, Art Unit 1797